WE CLAIM:

1. A method of operating a plurality N of seismic vibrators simultaneously with continuous sweeps, and separating the seismic response for each vibrator, said method comprising the steps of:

(a) loading each vibrator with a unique continuous sweep signal consisting of $M \geq N$ segments, the i^{th} segment being of the same duration for each vibrator, $i = 1, 2, \ldots, M$;

(b) activating all vibrators and using at least one detector to detect and record the combined seismic response signals from all vibrators;

(c) selecting and recording a signature for each vibrator indicative of the motion of that vibrator;

(d) parsing the vibrator motion record for each vibrator into M shorter records, each shorter record coinciding in time with a sweep segment, and then padding the end of each shorter record sufficiently to extend its duration by substantially one listening time;

(e) forming an M x N matrix s whose element $s_{ij}(t)$ is the padded shorter vibrator motion record as a function of time t for the i^{th} vibrator and j^{th} sweep segment;

(f) parsing the seismic data record from step (b) into M shorter records, each shorter record coinciding in time with a padded shorter record of vibrator motion from step (d);

(g) forming a vector $\vec{d}$ of length M whose element d_i is the i^{th} shorter data record from the preceding step;

(h) solving for $E_j(f)$ the following system of M linear equations in N unknowns

$$S\vec{E} = \vec{D}$$

where $S_{ij}(f)$ is the Fourier transform to the frequency (f) domain of $s_{ij}(t)$ and $D_i(f)$ is the Fourier transform of $d_i(t)$, where $i = 1, 2, \ldots M$ and $j = 1, 2, \ldots N$; and

(i) inverse Fourier transforming the $E_j(f)$ to yield $e_j(t)$.

2. The method of claim 1, wherein each sweep segment is selected from one of the following sweep-design categories: (a) linear, (b) nonlinear, and (c) pseudo-random.

3. The method of claim 1, wherein all of the N unique continuous sweeps are identical except for the phase of their segments.

4. The method of claim 3, wherein all N segments are identical except for phase, and the phase differences for the N sweeps are determined by the following steps: (a) constructing a reference sweep by starting with a preselected reference segment, then advancing the segment $360/M$ degrees in phase to make the second segment, then advancing the phase $360/M$ more degrees to make the third segment, and so on to generate a sweep of M segments; (b) constructing a first sweep by advancing the phase of the first segment of the reference sweep by 90 degrees; (c) constructing a second sweep by advancing the phase of the second segment of the reference sweep by 90 degrees; (d) and so on until N sweeps are constructed.

5. The method of claim 1, wherein each unique continuous sweep has a duration in time sufficiently long to collect all seismic data desired before relocating the vibrators.

6. The method of claim 1, wherein the vibrator signature record for each vibrator is a weighted sum or ground force record of the motion of that vibrator.

7. The method of claim 1, wherein $M = N$ and the system of linear equations $S\vec{E} = \vec{D}$ is solved by matrix methods comprising the steps of deriving a separation and inversion filter $(S)^{-1}$ by inverting the matrix S, then performing the matrix multiplication $(S)^{-1}\vec{D}$.

8. The method of claim 1, wherein the system of linear equations $S\vec{E} = \vec{D}$ is solved by matrix methods and the method of least squares

comprising the steps of deriving a separation and inversion filter of the form $F = (S^{*}S)^{-1}S^{*}$, then performing the matrix multiplication $F\vec{D}$.

9. The method of claim 1, wherein each segment has a duration that is at least as long as the seismic wave travel time down to and back up from the deepest reflector of interest.